Intervention to Decrease Emergency Department Crowding: Does It Have an Effect on Return Visits and Hospital Readmissions?

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Study objectives: We evaluate the effect of a multifaceted intervention to decrease emergency department crowding on the incidence of return visits to the ED or a hospital ward. The intervention included increased emergency physician coverage, the designation of physician coordinators, and new hospital policies regarding laboratory, consultation, and admission procedures.

Methods: The incidence of return visits within 7 days of discharge was estimated in samples from 2 populations (ie, patients discharged from the ED and patients discharged from the hospital) and during a 12-month period before and a 12-month period after the implementation of the intervention. Return visits were categorized into the following groups: (1) scheduled or not and (2) related or not to initial visit. Logistic regression was used in subsamples to assess the effect of the intervention while controlling for potential confounders. By using information from the provincial medical services database, variation between the periods before and after implementation of the intervention in the incidence of return visits to any ED was compared between the study hospital and 2 external control hospitals.

Results: No difference was found in the incidence of return visits between the periods before and after implementation of the intervention, either for patients discharged from the ED (all returns: 11.0% versus 12.4%, 95% confidence interval on difference [CID] –1.5% to 4.3%; unscheduled-related returns: 6.5% versus 5.8%, 95% CID –2.8% to 1.6%) or the hospital (all returns: 6.8% versus 6.6%, 95% CID –2.5% to 2.1%; unscheduled-related returns: 4.2% versus 4.0%, 95% CID –2.0% to 1.7%). This lack of effect remained even after controlling for potential confounders. Variation between the periods before and after implementation of the intervention in the incidence of return to any ED was similar in the 3 hospitals examined.

Conclusion: Our successful hospital intervention to decrease crowding reduced the mean length of stay for patients discharged from the ED from 13.8 to 5.9 hours, without resulting in increased return visits to the ED or hospital readmission.

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INTRODUCTION

Hospital emergency department crowding affects industrialized countries all over the world.[1-6] In the province of Quebec, the first reports of crowded EDs can be traced back to the 1970s.[7] The current situation in most urban and suburban EDs of the province remains fragile and is being compounded by additional pressure resulting from health care reforms and the aging population.

ED crowding can compromise the quality of patient care by prolonging waiting times, delaying treatment, and increasing the risk of adverse outcomes.[8,9] It is also a source of frustration among staff, as well as a cause of dissatisfaction among patients.[1,3] Therefore, reducing crowding should be beneficial for patients and is a high priority on the agenda of health care administrators, governments, and the public. However, it could also be argued that maintaining a noncrowded ED requires hospital and ED staff to accelerate decisionmaking processes, including discharges. In some cases, this could lead to premature discharges, not only from the ED but also from the inpatient wards of the hospital, in order to accommodate patients requiring admission from the ED. In turn, these could increase the incidence of hospital readmission and ED return visits.[10-15]

In 1992, the Jewish General Hospital ED, like many other hospitals in Montreal, found itself grappling with a chronic crowding problem. Average occupancy levels were nearly double the number of stretchers that the ED was designed to accommodate, and the average length of stay was in excess of 20 hours, with the suggested norm in Quebec being 10 hours.[16] As a means to reduce ED crowding, a hospital-wide intervention was implemented. Numerous measures, pertaining both to the structure and the process of care, were instituted within a 3-month period and maintained thereafter (Appendix). The impetus for implementing these changes was created at least in part by financial disincentives imposed by the provincial health ministry, which penalized hospitals where patients experienced prolonged (>48 hours) ED stays. However, at the Jewish General Hospital, there was also a change in the hospital culture and priorities, recognizing the fact that ED crowding is an unacceptable hospital-wide problem. Despite an observed increase in the number of ED visits per day, the intervention resulted in an immediate and sustained resolution of the crowding problem.[17] This translated into a decreased rate of stretcher occupancy, from 183% to 118%, and a reduction in the average length of stay of all ED patients, including those hospitalized and discharged, from 21 to 9 hours over a 4-year period from 1992 to 1996.

The dramatic improvement in crowding observed after the intervention, however, raised concerns about the potential negative effects of premature or inappropriate discharges both from the ED and the inpatient wards. The present study was therefore designed to evaluate the effect of this successful intervention to decrease crowding on the quality of care provided to patients in the ED and hospital wards, as measured by the incidence of return visits after discharge.

MATERIALS AND METHODS

The Jewish General Hospital is a 650-bed, tertiary care adult hospital affiliated with McGill University in Montreal. In 1992, its ED had an annual census of 50,000 patients, of which approximately half were directed to stretchers in the main ED, and the other half were sent to an ambulatory or fast track area. This study targets patients discharged from the main ED (stretcher cases) and inpatient hospital wards.

We assessed the effect of the intervention by comparing the incidence of return visits before and after the implementation of the intervention in patients discharged from the ED and, separately, in patients discharged from the hospital. A return visit was defined as either a visit to the ED (regardless of whether it led to hospitalization) or a direct hospitalization (not through the ED) within 7 days of discharge. For ED patients, the preintervention sample consisted of all patients discharged from the main ED on every 13th day between August 2, 1992, and August 1, 1993, for a total of 28 days of sampling. The corresponding postintervention sample, also of 28 days, was collected between October 17, 1993, and October 16, 1994. Sampling days in this

manner ensured the appropriate representation of week days, weekend days, and holidays, and 1-year sampling periods accounted for seasonal variations.

The same procedure was used to sample patients discharged from the hospital wards and estimate their incidence of return visits within 7 days in the preintervention and postintervention periods. Patients discharged from the obstetrics or neonatology wards were excluded because beds from these departments are protected and therefore not subjected to pressures for admissions from the ED. We also excluded patients who died in the hospital at the initial (index) visit, those transferred to other acute-care hospitals or to the Jewish General Hospital long-term care unit, those discharged from the Jewish General Hospital long-term care unit or with an index hospitalization of longer than 60 days in duration, and those already sampled during the same period. Finally, we excluded patients living outside the province of Quebec because of our inability to track their ED use and their very low risk of returning because of geographic inaccessibility (closest provincial border 50 miles from hospital). From the computerized hospital database, we obtained information on age, sex, postal code, ED visits, and hospitalizations in the year preceding the index discharge; length of stay at the index visit; and whether a return visit occurred within 7 days of the index discharge. We also obtained data on out-of-hospital mode of transportation and diagnostic category for patients discharged from the ED and on admitting service for patients discharged from the hospital.

Preintervention and postintervention samples of patients discharged from the ED were combined, and a case-control sampling strategy was implemented to select a subsample of patients whose charts were to be reviewed in detail. All patients from the combined samples having returned to the Jewish General Hospital within 7 days of discharge were selected as case patients. Unmatched control subjects were identified in the combined sample by randomly selecting an equally sized group of patients not having returned. The same procedure was used to select case patients and control subjects from the combined samples of patients discharged from the hospital. Two independent pairs of physicians, specifically trained in structured data extraction for the purpose of this study, reviewed the medical charts of all case patients and control subjects. One of each of the physician pairs was blind to the study hypothesis.

Each return visit was categorized according to whether it was scheduled or not and whether it was related to the index visit or not. A return visit was classified as scheduled if there was any indication in the chart that the patient had been told to come back to the ED or the hospital on a specific date. A return visit was related to the index visit if the presenting complaint or the principal diagnosis was the same as, or a probable consequence of, either the patient's medical condition or any intervention initiated at the index visit. Any discrepancy between teams on the categorization of return visits was resolved by consensus.

For case patients and control subjects, information was also extracted from the entire chart on other potential risk factors for return visits not readily available in the computerized hospital database. These elements were drawn from the literature on ED return visits, hospital readmissions, and the Aday-Andersen model of health services use[14,18-28] and included the following: the identification of a usual treating physician (either general practitioner or specialist); number of active comorbidities (eg, asthma, cancer not in remission) from a predetermined list; psychiatric condition; chronic condition; type of admission (for hospital discharges only: urgent or elective); and severity of condition at index visit or admission. The latter characteristic, categorized as low, moderate, or high, was an implicit judgment by the physician reviewers of the patient's probability of dying or having functional impairment during the natural course of the disease. In case of disagreement between reviewers, the following guidelines were followed for the analysis: (1) computing the average number of identified comorbidities; (2) using the positive assessments for having a usual physician and a psychiatric condition because disagreement for these variables could only occur if one of the reviewers had missed the information in the chart; and (3) creating additional categories ("assessment uncertain") for the variables of severity and chronic condition.

To assess the presence of any system-wide, as opposed to Jewish General Hospital–specific, change in the incidence of return visits between the preintervention and postintervention periods, we obtained information on samples of patients discharged from 2 other Montreal hospitals. The 2 hospitals were selected because they were large, tertiary-care, university-affiliated hospitals comparable to the Jewish General Hospital. Although both had taken measures to try to reduce their own crowding problems during the periods of interest, the transient and limited nature of their improvements in occupancy and length of stay during these periods suggested that their measures were ineffective[16] and thus would have a minimal effect on the incidence of return visits. Each hospital provided us with information on patients discharged from either their ED or an inpatient ward on any of 14 days equally distributed (every 26th day) during the years corresponding to each of our preintervention and postintervention periods. These samples of discharged patients and, to ensure comparability, the original Jewish General Hospital samples were linked to the provincial database on medical services (Régie de l'Assurance-Maladie du Quebec). This database provides billing information on physicians' services obtained in any ED of the province. We were thus able to assess whether patients discharged from one of these 3 hospitals (or EDs) had received ED services in any hospital of the province in the following 7 days. We used this information to estimate and compare the incidence of return visits to any ED of the province for patients discharged from the ED and the wards of the 3 hospitals during the preintervention and postintervention periods.

Ethics approval was obtained from the Ethics and Research Committee of the hospital and the provincial Access to Information Commission.

Before the study, we estimated that 28 days of sampling during each period (corresponding to approximately 960 patients discharged from the main ED and 1,040 patients discharged from the hospital) would allow for the reliable estimation of the incidence of return visits in each period and each group of patients (95% approximate confidence intervals [CIs] ±3.2%). Assuming a baseline incidence of return visits of 10%, the projected sample size was also sufficient to ensure an 85% power to detect an increase of 5% in the incidence of return visits between the preintervention and postintervention periods.

We compared, between periods, the incidence of all return visits, unscheduled return visits, and unscheduled-related return visits by using 95% approximate CIs for differences in proportions.

Logistic regression was used in the case-control subsamples to determine the independent effect of the intervention on the risk of return visits while controlling for potential confounders. All risk factors for return visits that would have been susceptible to changing between periods but not as a result of the intervention were considered as potential confounders.[29] According to the Aday-Andersen model of health services use,[27,28] these risk factors were grouped into the following: (1) predisposing factors (ie, age, sex, and previous ED visits [for ED discharges] and previous hospitalizations [for hospital discharges]); (2) enabling factors (ie, having a usual treating physician); and (3) need (ie, severity, number of comorbidities, chronic condition, psychiatric condition, relative length of stay before index discharge [compared with median length of stay of all patients sampled during the period], type [urgent or elective], department [surgical and medical] of index admission [for hospital discharges], and diagnostic category [for ED discharges]). We compared the crude odds ratio (OR; and 95% CI) of the association between the variable "period" (before or after intervention) and the risk of return visits, with the corresponding estimate adjusted for predisposing, enabling, and need factors simultaneously. Because we suspected that certain vulnerable subgroups could have been affected more importantly by the intervention, we assessed the presence of interactions between the variable "period" and the following factors: age, severity, psychiatric condition, and department (for hospital discharges). This was done by inspecting the size of the estimated regression coefficients and associated *P* values for the corresponding 2-way product terms.[30] The fitted models containing all potential confounders were checked

against the data by computing Hosmer-Lemeshow lack-of-fit tests.[31] The regressions were performed on the following 2 outcomes: (1) return visits of any type and (2) unscheduled-related return visits only. For the latter analysis, patients who returned for a scheduled or unrelated visit were eliminated from the case group.

To detect a system-wide change in return visits between the preintervention and postintervention periods, we estimated the between-periods difference (and 95% CI on difference) in the incidence of return visits to any ED of the province for patients discharged from the Jewish General Hospital and separately for those discharged from each of the 2 external control hospitals. A logistic regression analysis was also used to determine whether the period was predictive of return visits once a control was exerted for the hospital, season, patient age, sex, arrival by ambulance (for ED patients), and relative length of stay at index visit or admission.

Analyses were performed with SAS for Windows (versions 6.12 and 8.1, SAS Institute, Inc., Cary, NC). No adjustment was made for multiple comparisons.

RESULTS

A total of 1,935 discharges from the ED and 2,766 discharges from hospital wards occurred during the 56 sampling days (28 before and 28 after the intervention). Table 1 shows the numbers of patients excluded and final sample sizes.

Discharged patients represented, on average, 70.2% of all ED visits in the preintervention period and 65.0% in the postintervention period. Table 2 shows the characteristics of patients sampled during the preintervention and postintervention periods. Overall, 11.7% of patients discharged from the ED returned within 7 days. None were admitted directly to the hospital without going through the ED. There were no significant differences between the 2 periods in terms of either the incidence of all return visits, unscheduled return visits, or unscheduled-related return visits (Table 3).

For the multivariate analysis of the case-control subsample, we combined highly and moderately severe conditions because too few patients fell into the highly severe category. The crude OR for the association between the period and the risk of return visit of all types was very close to the null value (OR_{crude}=1.08; 95% CI 0.74 to 1.59) and, along with its CI, remained almost unaffected by the adjustment for potential confounders (Table 4). The multivariate model suggests that having a condition of high or uncertain severity increases the risk of return visits of all types, whereas having a chronic condition decreases this risk (Table 4). Similar results were obtained when we examined unscheduled-related returns only. The crude OR for the variable "period" was not different from the null value (OR_{crude}=0.88; 95% CI 0.56 to 1.39) and did not change in an important manner when we adjusted for potential confounders (Table 4). Therefore, this analysis suggests that there was no effect attributable to the study period and, thus, the intervention on the incidence of return visits. Severity, numerous comorbidities, and a greater than median length of stay at the index visit appeared to increase the risk of unscheduled-related return visits. For both return visits of all types and unscheduled-related return visits, the regression coefficients for the

Table 1.
Sample sizes and exclusion criteria.

	ED Discharges		Hospital Discharges	
Sample and Exclusion	**Pre-intervention**	**Post-intervention**	**Pre-intervention**	**Post-intervention**
Total	899	1,036	1,326	1,440
Discharged from obstetrics or neonatology	—	—	404	402
Patient already sampled during the same period	7	27	20	32
Chart not found	6	8	3	3
Transferred to other hospital or JGH long-term care unit	12	0	18	15
Patient from out of province	6	5	2	9
Death before discharge	1	0	31	47
Length of stay ≥60 d	—	—	12	10
Samples for analysis	867	996	836	922

JGH, Jewish General Hospital.

2-way interactions (period by age, severity, and psychiatric condition) were either small, reflecting a small effect, if any, or had large *P* values, indicating that they could not be accurately estimated and were therefore excluded from the models.

Hospitalizations went from an average of 939 per month in the preintervention period to approximately 1,028 after the intervention. Admissions from the ED accounted for approximately 47% and 58% of those in the preintervention and postintervention periods, respectively. Table 5 shows the characteristics of patients discharged from the hospital, as well as the incidence of return visits, in each period. Overall, 6.7% of patients discharged from the hospital returned either to the ED or directly to a hospital ward for readmission within a week of discharge. Again, as was the case for ED patients, there were no significant differences between the 2 periods in the incidence of return visits of all types, unscheduled only return visits, and unscheduled-related only return visits either to the ED or the hospital.

For the multivariate analysis, we initially used 5 categories of severity (ie, low, low-moderate, moderate, moderate-high, and high) to allow for disagreement between reviewers. Because the effect of the 3 higher categories on the risk of return visits was similar, we combined them to limit the number of dummy variables in the model. We also eliminated the variable "usual treating physician identified" because not having such a physician was too rare an exception in hospitalized patients. The crude ORs for the effect of the period were not different from the null value, although point estimates favored a decrease in effect (reduced risk of returns) in the postintervention period, irrespective of whether return visits of all types (OR_{crude}=0.85; 95% CI 0.53 to 1.37) or unscheduled-related return visits (OR_{crude}=0.84; 95% CI 0.48 to 1.47) were being predicted. Again, neither was affected by the adjustment for confounders (Table 6). The model explaining return visits of all types suggests an association of this outcome with the measures of severity and chronic condition, although for both factors, only patients with conditions difficult to assess appear at an increased risk. Compared with an elective hospitalization, an urgent hospitalization appears to increase the risk of an

Table 2.
Characteristics of patients discharged from the ED.

Characteristic	Preintervention Period, % (N=867)	Postintervention Period, % (N=996)
Age, y		
≤64	66.4	69.3
65–74	13.0	13.7
≥75	20.5	17.1
Sex		
Female	58.0	56.2
Male	42.0	43.8
Transportation		
Ambulance	27.0	25.2
Other	73.0	74.8
No. missing	1	
ED visits within past 12 mo (excluding index visit)		
0	64.1	62.6
1–2	27.6	27.4
≥3	8.3	10.0
No. missing	1	
Hospitalizations within past 12 mo		
0	82.0	83.4
1	14.1	11.1
≥2	3.9	5.4
Diagnostic category		
Trauma	4.2	7.9
Cardiac	12.8	11.0
Psychosocial	6.0	5.3
Respiratory	8.2	7.4
Gastrointestinal	14.2	18.0
Other	54.6	50.4
No. missing	2	1
Length of stay in ED, h		
Mean (SD)	13.8 (37.2)	5.9 (6.7)
Median (interquartile range)	4.9 (6.6)	3.8 (4.2)

Table 3.
Incidence of return visits within 7 days of discharge from the ED.

Type of Return Visit	Pre-intervention, % (N=867)	Post-intervention, % (N=996)	95% CI on Difference, %
All return visits	11.0	12.4	–1.5 to 4.3
Unscheduled return visits	6.8	6.9	–2.2 to 2.4
Unscheduled-related return visits	6.5	5.8	–2.8 to 1.6

unscheduled-related return visit, as does a condition of uncertain acuteness. Finally, the data did not support the inclusion of the preselected 2-way product terms (period by age, severity, department, and psychiatric condition) in the models.

A total of 8,627 adult health insurance numbers were submitted for linkage with the Régie de l'Assurance-Maladie du Quebec database. Of those, 8,332 (96.6%) numbers, accounting for 8,658 discharges, were validated. Table 7 shows the incidence of return visits to

Table 4.
Multiple logistic regression models of all return visits and unscheduled-related return visits after discharge from the ED.

	All Return Visits			Unscheduled-Related Return Visits		
Variable	**Case Patients (N=211)**	**Control Subjects (N=213)**	**OR (95% CI)**	**Case Patients (N=114)**	**Control Subjects (N=213)**	**OR (95% CI)**
Period						
Preintervention	93	98	Reference	56	98	Reference
Postintervention	118	115	0.94 (0.62 to 1.44)	58	115	0.80 (0.48 to 1.35)
Predisposing factors						
Age, y						
≤64	146	136	Reference	71	136	Reference
64–74	29	31	0.91 (0.47 to 1.74)	18	31	0.89 (0.40 to 1.98)
≥75	36	46	0.60 (0.31 to 1.13)	25	46	0.62 (0.28 to 1.34)
Sex						
Female	123	117	Reference	62	117	Reference
Male	88	96	0.79 (0.51 to 1.23)	52	96	0.89 (0.52 to 1.54)
ED visits within past 12 mo						
0	125	126	Reference	67	126	Reference
1–2	59	70	0.82 (0.51 to 1.32)	28	70	0.57 (0.31 to 1.04)
≥3	27	17	1.71 (0.78 to 3.78)	19	17	1.50 (0.61 to 3.65)
Enabling factors						
Usual treating physician identified						
No	47	61	Reference	24	61	Reference
Yes	164	152	1.50 (0.90 to 2.49)	90	152	1.59 (0.84 to 2.99)
Need factors						
ED diagnostic category						
Trauma	12	12	Reference	7	12	Reference
Cardiac	14	23	0.63 (0.20 to 1.95)	11	23	0.62 (0.16 to 2.38)
Psychosocial	16	9	1.59 (0.41 to 6.20)	13	9	1.53 (0.32 to 7.33)
Respiratory	11	22	0.53 (0.17 to 1.74)	7	22	0.60 (0.14 to 2.46)
Gastrointestinal	39	36	1.38 (0.50 to 3.80)	19	36	1.22 (0.35 to 4.24)
Other	119	111	1.10 (0.44 to 2.77)	57	111	0.86 (0.28 to 2.64)
Psychiatric condition						
No	186	198	Reference	95	198	Reference
Yes	25	15	1.39 (0.59 to 3.27)	19	15	1.98 (0.75 to 5.26)
Comorbidities						
0–1	165	169	Reference	78	169	Reference
≥2	46	44	1.23 (0.67 to 2.27)	36	44	2.13 (1.04 to 4.35)
Chronic condition						
No	164	154	Reference	83	154	Reference
Uncertain	29	28	0.61 (0.32 to 1.16)	15	28	0.55 (0.25 to 1.23)
Yes	18	31	0.37 (0.18 to 0.77)	16	31	0.55 (0.24 to 1.24)
Severity						
Low	68	110	Reference	34	110	Reference
Uncertain	87	62	2.52 (1.56 to 4.05)	46	62	2.53 (1.39 to 4.59)
Moderate-high	56	41	2.85 (1.62 to 4.99)	34	41	2.78 (1.43 to 5.39)
Length of stay in ED						
<Period median	85	115	Reference	44	115	Reference
≥Period median	116	98	1.47 (0.96 to 2.24)	70	98	1.80 (1.08 to 3.00)
Hosmer-Lemeshow test (*P* value)			.25			.99

any ED of the province by period for patients discharged from the Jewish General Hospital or 1 of the 2 control hospitals. The Régie de l'Assurance-Maladie du Quebec figures for incidence of return visits at the Jewish General Hospital do not correspond to those reported in Tables 3 and 5 because the Régie de l'Assurance-Maladie du Quebec data set provides information on return visits to any ED in the province, whereas we reported returns only to the Jewish General Hospital ED, and the exclusion criteria used in our local analyses could not be repeated for the external comparison. No significant change between periods in the incidence of return visits could be detected in any hospital. However, in some comparisons, the numbers were small, and thus the CIs were large, and a greater than 5% increase in the incidence of return visits after an ED discharge could only be ruled out at the Jewish General Hospital. The logistic regression analysis in this data set confirmed that return visits to any ED after discharge from the ED or the hospital could not be explained by a general change between the 2 periods once hospital, season, patient's mode of transportation (ED discharges only), age, sex, and length of stay relative to the period and hospital-specific median were accounted for (data not shown).

Table 5.
Characteristics of patients discharged from the hospital and incidence of return visits within 7 days of discharge.

Characteristic	Pre-intervention Period, % (N=836)	Post-intervention Period, % (N=922)	95% CI on Difference, %
Age, y			
≤64	48.9	52.0	
65–74	23.3	19.6	
≥75	27.8	28.4	
Sex			
Female	51.7	51.1	
Male	48.3	48.7	
Department			
Medicine	40.9	47.3	
Surgery*	59.1	52.7	
ED visits within past 12 mo			
0	42.8	35.1	
1–2	44.6	49.4	
≥3	12.6	15.5	
Hospitalizations within past 12 mo (excluding index hospitalization)			
0	75.0	70.4	
1	17.6	20.0	
≥2	7.4	9.7	
Median length of hospitalization, d			
Internal medicine			
Mean (SD)	12.1 (11.9)	9.3 (10.8)	
Median (interquartile range)	8 (13)	6 (10)	
Surgery			
Mean (SD)	7.7 (9.2)	6.8 (8.1)	
Median (interquartile range)	4 (8)	3 (7)	
All return visits	6.8	6.6	–2.5 to 2.1
To the ED	5.1	5.3	–1.9 to 2.3
Directly to the hospital	1.7	1.3	–1.5 to 0.8
Unscheduled return visits	5.3	5.4	–1.9 to 2.3
To the ED	4.9	5.3	–1.6 to 2.5
Directly to the hospital	0.4	0.1	–0.7 to 0.2
Unscheduled-related return visits	4.2	4.0	–2.0 to 1.7
To the ED	3.8	3.9	–1.7 to 1.9
Directly to the hospital	0.4	0.1	–0.7 to 0.2

*Includes all surgery departments and others in which surgery is very likely to be performed: gynecology; urology; orthopedics; cardiovascular-thoracic; ear, nose, and throat; and ophthalmology.

DISCUSSION

ED crowding is a complex and multifactorial problem, and the need to reduce or eliminate it has long been recognized.[1,2,14,32,33] Corrective measures have been proposed,[2,3,32-35] and their effectiveness and efficiency have been assessed in some cases.[36,37] However, none of these measures have been evaluated in terms of their effect on the quality of care delivered to patients. The need to evaluate their effect on patients' health thus remains and would ideally be met by using direct measures of adverse health outcomes after discharge. Unfortunately, these cannot be extracted from most hospital databases. Hospital readmissions and ED return visits have been used as proxies for adverse health outcomes and have been suggested as a means of assessing the quality of care.[11-13,38-42] The rationale is that patients discharged prematurely or treated inadequately are more likely to bounce back after discharge. To our knowledge, the present study is the first designed to investigate the potential negative effect of measures to reduce ED crowding both on ED and hospitalized patients. We aimed at detecting a 5% increase in the risk

of return visits because a smaller difference would not counterbalance the numerous advantages, both for patients and ED functioning, of maintaining an appropriately functioning and uncrowded ED.

We found that the intervention to reduce crowding did not increase the incidence of ED return visits or hospital readmissions. Our primary concern was that the pressure exerted to optimize patient flow in the ED could compromise the safe and judicious discharge of patients. Another concern was that to comply with new policies on length of stay for ED patients awaiting admission, providers of in-patient hospital services might have fallen subject to significant pressure to turn over patients. Although patients from medical wards and, to a lesser extent, from surgery departments did show shortened lengths of stay in the second 12-month

Table 6.
Multiple logistic regression models of all return visits and unscheduled-related return visits after discharge from the hospital.

	All Return Visits			Unscheduled-Related Return Visits		
Variable	**Case Patients (N=118)**	**Control Subjects (N=158)**	**OR (95% CI)**	**Case Patients (N=72)**	**Control Subjects (N=158)**	**OR (95% CI)**
Period						
Preintervention	57	70	Reference	35	70	1.00 Reference
Postintervention	61	88	0.90 (0.53 to 1.53)	37	88	0.81 (0.43 to 1.52)
Predisposing factors						
Age, y						
≤64	54	88	Reference	34	88	Reference
64–74	26	33	1.29 (0.62 to 2.69)	16	33	1.26 (0.53 to 3.00)
≥75	38	37	1.35 (0.68 to 2.70)	22	37	1.15 (0.50 to 2.66)
Sex						
Female	71	75	Reference	43	75	Reference
Male	47	83	0.63 (0.38 to 1.05)	29	83	0.67 (0.36 to 1.24)
Hospitalizations within past 12 mo						
0	81	110	Reference	46	110	Reference
1–2	22	35	0.78 (0.40 to 1.47)	16	35	0.97 (0.46 to 2.03)
≥3	15	13	1.33 (0.56 to 3.14)	10	13	1.63 (0.62 to 4.30)
Need factors						
Department						
Medicine	65	75	Reference	39	75	Reference
Surgery	53	83	1.24 (0.63 to 2.42)	33	83	1.77 (0.77 to 4.04)
Type of admission						
Elective	43	77	Reference	20	77	Reference
Urgent	75	81	1.79 (0.82 to 3.91)	52	81	3.48 (1.34 to 9.07)
Psychiatric condition						
No	109	148	Reference	66	148	Reference
Yes	9	10	1.03 (0.36 to 2.96)	6	10	1.22 (0.38 to 3.91)
Comorbidities						
0–1	76	122	Reference	46	122	Reference
≥2	42	36	1.61 (0.80 to 3.22)	26	36	1.29 (0.56 to 2.99)
Chronic condition						
No	41	62	Reference	27	62	Reference
Uncertain	34	26	2.60 (1.29 to 5.26)	21	26	2.75 (1.22 to 6.22)
Yes	43	70	1.26 (0.63 to 2.50)	24	70	1.38 (0.62 to 3.05)
Severity						
Low	15	32	Reference	7	32	Reference
Uncertain	25	21	2.52 (1.01 to 6.29)	13	21	2.66 (0.84 to 8.42)
Moderate-high	78	105	1.28 (0.58 to 2.84)	52	105	1.48 (0.53 to 4.18)
Length of stay in ED						
<Period median	56	72	Reference	29	72	Reference
≥Period median	62	86	0.69 (0.39 to 1.24)	43	86	0.85 (0.42 to 1.70)
Hosmer-Lemeshow test (*P* value)			.87			.69

period, the risk of return visits for hospitalized patients did not increase. The results are in keeping with the findings of Harrison et al,[40] showing that shorter hospital stays in Winnipeg for selected medical and surgical reasons did not increase the incidence of readmissions.

Of all the return visits, unscheduled-related visits are the most likely to reflect quality of care. Yet, in our study, even when we controlled for important confounders using a multivariate analysis, no association was revealed between the intervention to reduce crowding and the risk of unscheduled-related return visits.

The theory of Aday and Andersen[27] and Anderson[28] stipulates that need is the most immediate cause of health service use, as opposed to predisposing factors that describe an individual's "propensity" to use services and enabling factors, which describes patients' available "means" for using services. In accordance with this model, we found that the factors most strongly associated with the risk of return visits were clinical indicators of patient needs, such as severity, and whether the condition is chronic. Greater severity and complexity have been the most often isolated risk factors for hospital readmission.[14,23-25,42] These factors have also been associated with frequent ED use.[43,44]

Table 7.
Incidence of return visits to any ED of the province by hospital, period, and place of discharge.

	ED Discharges			Hospital Discharges		
Hospital	Pre-intervention*	Post-intervention*	95% CI on Difference, %	Pre-intervention*	Post-intervention*	95% CI on Difference, %
JGH						
Discharges	818	966		1,129	1,268	
Returns, %	14.9	13.6	–4.6 to 1.9	4.1	5.2	–0.6 to 2.8
Control A						
Discharges	278	268		904	889	
Returns, %	14.0	16.8	–3.3 to 8.8	4.2	3.7	–2.3 to 1.3
Control B						
Discharges	169	281		870	818	
Returns, %	12.4	14.2	–4.6 to 8.2	3.5	3.9	–1.3 to 2.3

*Preintervention refers to the period between August 2, 1992, and August 1, 1993, and Postintervention refers to the period between October 17, 1993, and October 16, 1994.

However, the objective of this study was not to identify predictors of return visits, and therefore, these results must be interpreted cautiously.

Alternative explanations for the lack of adverse effects of the intervention should also be considered. First, even if no effect could be detected over a whole year, the intervention could have had shorter-term or time-variable effects. For instance, it could have created an incentive for hospital and ED personnel to improve the quality of their work in general, at least in the first few months after its implementation. Any potential increase in the incidence of return visits caused by the intervention itself would thus have been partially or totally masked during this period by the improvement in quality of care. We tried to assess the possibility of a time-variable effect by separating the preintervention and postintervention periods into 2-month intervals and calculating an incidence of return for each. Considerable overlap was found in CIs around bimonthly incidences, and no specific trend could be isolated.

Second, although patients as a whole did not appear to be adversely affected by the intervention, it is possible that subgroups of vulnerable patients, such as the elderly or those with a severe condition, could have suffered from premature discharge. Our attempts to compare the incidence of return before and after intervention in specific subgroups of high-risk patients of the initial study samples were impeded by small subgroup sizes and thus lack of power. In the case-control subsamples and corresponding logistic regression analyses, none of the preselected 2-way terms improved the models. However, the large *P* values associated with some of these indicate that there might be an effect but that, again, there was insufficient power to detect it.[30] Finally, hypotheses pertaining to other subgroups, such as that of patients with a reduced functional autonomy, could not be adequately explored with the available data.

Third, an increase in return visits could have been missed at the Jewish General Hospital because patients returned to another hospital's ED. We could not verify this in our main samples and case-control subsamples. However, had this been the case, we should have detected this increase in the external control data set

(neighboring hospitals). In fact, the Jewish General Hospital was the only 1 of the 3 hospitals in which an increase in return visits after the intervention could be ruled out. This external comparison also makes it unlikely that a system-wide decrease in the incidence of return visits in Montreal is the explanation for the lack of increase at the Jewish General Hospital. The regional health care system was experiencing some wide-ranging changes over the course of the study period. These include the beginning of significant reforms involving the transfer of patient care from an inpatient to an outpatient setting, as well as progressive reductions in health care spending by the federal government, important budget cuts, and widespread shortages in nursing staff. Most of these changes would have actually been expected to increase the risk of return visits.

Fourth, it is also possible that an increase in visits to general practitioners, walk-in clinics, and external clinics after the index visit or admission became a substitute for an increase in ED return visits. We could not properly validate this hypothesis, but preliminary data from the Jewish General Hospital indicate that the incidence of visits to the hospital's outpatient clinics did increase after the intervention. However, most of these visits are scheduled and thus result from a well-controlled plan of care at the index visit rather than from premature discharge and inadequate care. As for urgent visits to walk-in clinics after discharge, we believe that any increase in their frequency should have been paralleled by an increase in return visits to any ED. Although not very likely, an increase in death rates after discharge in the postintervention period would also have artificially lowered the incidence of return visits during this period.

Fifth, other unaccounted for factors could have confounded the association between the intervention and the incidence of return visits. For instance, socioeconomic status, often found to be inversely associated with ED use,[18,45-48] could have masked an effect of the intervention if it were to have evolved favorably between periods. However, we could find no reason why the socioeconomic status of the hospital's clientele would change, much less improve, between the 2 periods examined in this study. Other unmeasured factors that could have acted as confounders include ethnicity, social support, and functional autonomy.

Finally, the link between quality of care and return visits might be weaker than expected. Thomas,[49] using a peer-review process to assess quality of care for 12 different conditions, found no clear indication of a relationship between quality of hospital care and readmission. However, his study did not allow for a straightforward distinction between scheduled and unscheduled readmissions, which is crucial given that the former represents a common standard of care, whereas the latter does not. In contrast, Ludke et al[41] studied early unscheduled readmissions and found evidence of a link between their occurrence and previous deficiencies in quality of care, as assessed through chart reviews and the use of common quality indicators (eg, occurrence of nosocomial infections). No comparable study of a direct association between quality of care in the ED and risk of return visits could be found in the literature. However, indirect evidence can be found in studies that suggest that a substantial portion of ED return visits are caused by quality-of-care issues: deficiencies in medical management or patient education and inadequate prescribed follow-up.[10,11,13,15] Another issue is the possibility that there might be a threshold above which changes in length of stay do not affect measures of quality. Although comparable with other Montreal EDs, our initial length of stay was very long, and, after the intervention, was still long despite substantial improvement. It might be that changes in quality would only be seen when comparing average to very short lengths of stay.

Although the intervention had no detectable effect on return visits, it is conceivable that inappropriate hospitalizations might have actually increased after the intervention. Also, in the effort to maximize the flow of patients through the ED, some patients might have been transferred to the ward or to other institutions before being adequately stabilized. These sequelae might have resulted from the implementation of the various policies designed to reduce ED delays through the acceleration of the decisionmaking processes and the transfer of patients requiring hospitalization. Waiting times in the ED, patient satisfaction, and the

number of patients who left without being seen are other outcomes that were not considered in this study. We assumed that waiting times would be either maintained or reduced as a result of the decreased total ED length of stay after the intervention, whereas patient satisfaction with ED care and number of patients who left without being seen would be positively affected as a result of their association with perceived length of stay and crowding.[8-9,50-52]

In conclusion, the present study is the first to show that it is possible to reduce ED crowding without increasing patients' risk of having to return to the ED or the hospital unexpectedly and with a related problem shortly after discharge.

Author contributions: SC, MA, JPC, and AC conceived and designed the study and, along with JD and AG, obtained research funding. AC, SC, CT, and EL supervised the conduct of the study and data collection. EL and JD designed the algorithms for chart review and classification categories of ED return visits. CT and EL were responsible for the supervision of chart reviews, whereas AC and CT undertook database quality control. JPC and SC provided advice on study methodology. SC analyzed the data and drafted the manuscript. All authors contributed substantially to its revision, whereas SC, MA, and EL take responsibility for the paper as a whole.

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REFERENCES

1. Derlet RW, Richards JR. Overcrowding in the nation's emergency departments: complex causes and disturbing effects. *Ann Emerg Med.* 2000;35:63-68.

2. Lynn SG, Kellerman AL. Critical decisionmaking: managing the emergency department in an overcrowded hospital. *Ann Emerg Med.* 1991;20:287-292.

3. MSSS (Québec Ministry of Health and Social Services). La situation dans les urgences en 1999: un défi majeur pour le réseau. Québec, Canada: Québec Ministry of Health and Social Services; 1999.

4. Doherty L. Hospitals turn ambulances away. *The Sydney Morning Herald.* November 3, 1998:3.

5. Miro O, Antonio MT, Jimenez S, et al. Decreased health care quality associated with emergency department overcrowding. *Eur J Emerg Med.* 1999;6:105-107.

6. Shih FY, Ma MH, Chen SC, et al. ED overcrowding in Taiwan: facts and strategies. *Am J Emerg Med.* 1999;17:198-202.

7. MAS (Ministère des Affaires Sociales du Québec). Rapport du comité "Système de services d'urgence." Quebec, Canada: Ministère des Affaires Sociales du Québec; 1974.

8. Bindman AB, Grumbach K, Keane D, et al. Consequences of queuing for care at a public hospital emergency department. *JAMA.* 1991;266:1091-1096.

9. Baker DW, Stevens CD, Brook RH. Patients who leave a public hospital emergency department without being seen by a physician, causes and consequences. *JAMA.* 1991;266:1085-1090.

10. Hu SC. Analysis of patient revisits to the emergency department. *Am J Emerg Med.* 1992;10:366-370.

11. Keith KD, Bocka JJ, Kobernick MS, et al. Emergency department revisits. *Ann Emerg Med.* 1989;18:964-968.

12. Henderson J, Graveney MJ, Goldacre MJ. Should emergency readmissions be used as health indicators and in medical audit? *Health Serv Manage Res.* 1993;6:109-116.

13. Pierce JM, Kellerman AL, Oster C. "Bounces": an analysis of short term return visits to a public hospital emergency department. *Ann Emerg Med.* 1990;18:964-968.

14. Thomas JW, Holloway JJ. Investigating early readmission as an indicator for quality of care studies. *Med Care.* 1991;29:377-394.

15. Wilkins PS, Beckett MW. Audit of unexpected return visits to an accident and emergency department. *Arch Emerg Med.* 1992;9:352-356.

16. MSSS (Québec Ministry of Health and Social Services). Registre des urgences. Quebec, Canada: Infocenter Service; 1994.

17. Grandjean P. Depuis un an, l'urgence de l'Hôpital Général Juif n'est plus congestionnée. *L'actualité Médicale.* 1994;15(42):6.

18. Jacoby LE, Jones SL. Factors associated with ED use by "repeater" and "non-repeater" patients. *J Emerg Nurs.* 1982;8:243-247.

19. McCusker J, Healy E, Bellavance F, et al. Predictors of repeat emergency department visits by elders. *Acad Emerg Med.* 1997;4:581-588.

20. McCusker J, Cardin S, Bellavance F, et al. Return to the emergency department among elders: patterns and predictors. *Acad Emerg Med.* 2000;7:249-259.

21. Friedman PD, Jin M, Karrison TG, et al. Early revisit, hospitalization, or death among older persons discharged from the ED. *Am J Emerg Med.* 2001;19:125-129.

22. Victor CR, Vetter NJ. The early readmission of the elderly to hospital. *Age Ageing.* 1985;14:37-42.

23. Corrigan JM, Martin JB. Identification of factors associated with hospital readmission and development of a predictive model. *Health Serv Res.* 1992;27:81-101.

24. Holloway JJ, Thomas JW. Factors influencing readmissions risk: implications for quality monitoring. *Health Care Financing Rev.* 1989;11:19-32.

25. Weissman JS, Stern RS, Epstein AM. The impact of patient socioeconomic status and other social factors on readmission: a prospective study in four Massachusetts hospitals. *Inquiry.* 1994;31:163-172.

26. Anderson GE, Steinberg EP. Hospital readmissions in the Medicare population. *N Engl J Med.* 1984;311:1349-1353.

27. Aday LA, Andersen RM. A framework for the study of access to medical care. *Health Serv Res.* 1974;9:208-220.

28. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav.* 1995;36:1-10.

29. Rothman KJ, Greenland S. *Modern Epidemiology.* 2nd ed. Philadelphia, PA: Lippincott-Raven; 1998.

30. Greenland S. Modeling and variable selection in epidemiologic analysis. *Am J Public Health.* 1989;79:340-349.

31. Hosmer D, Lemeshow S. *Applied Logistic Regression.* New York, NY: Wiley; 1989.

32. American College of Emergency Physicians. Measures to deal with emergency overcrowding. *Ann Emerg Med.* 1990;19:944-945.

33. GTI (Groupe Tactique d'Intervention des Urgences). Rapport de la première année d'activités du Groupe Tactique d'Intervention. Montreal, Quebec, Canada: Groupe Tactique d'Intervention des Urgences, Quebec Ministry of Health and Social Services; 1991.

34. Fromm RE, Gibb LR, McCallum WGB, et al. Critical care in the emergency department: a time-based study. *Crit Care Med.* 1993;21:970-976.

35. MSSS (Québec Ministry of Health and Social Services). Plan de désengorgement des urgences. Québec, Canada: Québec Ministry of Health and Social Services; 1986.

36. Roy M-R, Jacob R. Évolution de la situation des urgences: rapport semestriel d'avril 1988. Québec, Canada: Ministry of Health and Social Services; 1988.

37. Boyle P, Pineault R, Roberge D. Assessing Quebec's multi-component program to reduce emergency room overcrowding. *Can Public Policy.* 1992;18:189-202.

38. Williams EI, Fitton F. Factors affecting early unplanned readmission of elderly patients to hospital. *BMJ.* 1988;297:784-787.

39. Shaw CD. Clinical outcome indicators. *Health Trends.* 1989;21:37-40.

40. Harrison ML, Graff LA, Roos NP, et al. Discharging patients earlier from Winnipeg hospitals: does it adversely affect quality of care? *CMAJ.* 1995;153:745-751.

41. Ludke RL, Booth BM, Lewis-Beck JA. Relationship between early readmission and hospital quality of care indicators. *Inquiry.* 1993;30:95-103.

42. Ashton CM, Kuykendall DH, Johnson ML, et al. The association between the quality of inpatient care and early readmission. *Ann Intern Med.* 1995;122:415-421.

43. Mandelberg JH, Kuhn RE, Kohn MA. Epidemiologic analysis of an urban, public emergency department's frequent users. *Acad Emerg Med.* 2000;7:637-646.

44. Hansagi H, Allebeck P, Edhag O, et al. Frequency of emergency department attendances as a predictor of mortality: nine-year follow-up of a population-based cohort. *J Public Health Med.* 1990;12:39-44.

45. Bohland J. Neighborhood variations in the use of hospital emergency rooms for primary care. *Soc Sci Med.* 1984;19:1217-1226.

46. Genell Andren K, Rosenqvist U. Heavy users of an emergency department: psychosocial and medical characteristics, other health care contacts and the effect of a hospital social worker intervention. *Soc Sci Med.* 1985;21:761-770.

47. Mustard CA, Kozyrskyj AL, Barer M, et al. Emergency department use as a component of total ambulatory care: a population perspective. *CMAJ.* 1998;158:49-55.

48. NSW Health Department, Public Health Division. Report on the 1997 and 1998 NSW Health Surveys. Sydney, Australia: NSW Health Department; 2000.

49. Thomas JW. Does risk-adjusted readmission rate provide valid information on hospital quality? *Inquiry.* 1996;28:258-270.

50. Mohsin M, Bauman A, Ieraci S. Is there equity in emergency medical care? Waiting times and walk-outs in South Western Sydney hospital emergency departments. *Aust Health Rev.* 1998;21:133-149.

51. Hedges JR, Trout A, Magnusson AR. Satisfied patients exiting the emergency department (SPEED) study. *Acad Emerg Med.* 2002;9:15-21.

52. Spaite DW, Bartholomeaux F, Guisto J, et al. Rapid process redesign in a university-based emergency department: decreasing waiting time intervals and improving patient satisfaction. *Ann Emerg Med.* 2002;39:168-177.

APPENDIX.*

Measures implemented as part of an intervention to decrease crowding at the ED of the Sir Mortimer B. Davis Jewish General Hospital.†

- Increasing the ED attending staff coverage from 32 to 48 physician-hours per 24-hour period, corresponding to a 25% increase in the physician-hours/patient ratio.
- Making 2 physician-coordinators (1 ED-based and 1 ward-based) responsible for the following:
  1. Expediting the decisionmaking process in the ED for both admitted and discharged patients. Specifically, an emergency physician-coordinator took on the task of reassessing patients with extended ED stays for the purpose of finalizing disposition decisions.
  2. Ensuring sufficient bed allocation for ED patients awaiting admission. Both physician-coordinators served as liaisons between the ED and wards. The ward-based physician-coordinator ensured that hospital beds were allocated as efficiently as possible and that ward resources were adapted to match the admission load in the ED. This physician-coordinator was responsible for ensuring an appropriate duration of hospitalization for admitted patients and could, on occasion, force the cancellation of elective hospitalizations when the demand for admissions from the ED was high.
- Formulating and implementing a policy to deal with delays in responding to consultation requests and related disposition decisions. The policy set down guidelines for what constituted acceptable delays for hospital specialty services in terms of responding to a consultation request and in reaching a disposition decision for any given patient.
- Formulating and implementing a policy concerning "captive" patients, whereby in the event that their admission was indicated, they would be transferred to the hospital that knows them best. Captivity was defined by a previous hospitalization at that hospital within the past 3 years.
- A transfer-to-ward policy was instituted requiring that patients be transferred within 1 hour of bed assignment. After the implementation of this measure, we observed a substantial reduction in the length of ED stay between admission request and patients' transfer to the ward (from an average of 12.2 to 3.2 hours).
- Installation of both a pneumatic tube system and fax machines to minimize the turnover time for obtaining laboratory results for both admitted and discharged patients.
- Providing mixed-sex rooms such that patient rooms were no longer designated as all male or all female. This allowed for more efficient use of inpatient beds.
- Off-service admissions were allowed, meaning that room assignment for admitted patients was no longer restricted to specific wards with a tradition for caring for certain types of problems. For example, patients admitted to orthopedics could now be admitted to the urology ward (under the orthopedists' care) if resources dictated the need for that type of off-service admission. Certain bed assignments could not be violated (ie, monitored admissions to cardiology).
- Developing protocols clarifying the relationships and responsibilities regarding consultations and admissions between the ED and medical-surgical departments. An example of this included specific guidelines on which service should be responsible for admitting patients with benign mechanical back pain not necessitating a surgical intervention.
- Reaching an agreement with the geriatric service concerning the admission and relocation of geriatric patients. As a result, patients requiring hospitalization to the geriatric service could be admitted directly by the emergency physician (and outside of regular hours) after reviewing the case with the geriatrician on call rather than wait for a full ED-based evaluation by the geriatric team. Simultaneously, a great deal of effort was invested in transferring chronic care patients from acute care beds in the hospital to nursing home beds in the community.

*More information is available by request to the corresponding author.
†Please note that the intervention is described as it was originally implemented.